UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

COLORADO PLATEAU MANAGERS COALITION

SUMMARY CATALOG OF RESEARCH/INFORMATION/DATA NEEDS

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INTRODUCTION

The Colorado Plateau comprises one of the most unique physiographic landscapes in the world. This uniqueness, stark beauty and relative remoteness associated with it are rapidly becoming known on an international level. Visitation, recreational uses, in-migration, and associated socio-economic and demographic changes are increasing at what some would consider to be alarming rates, with potential long-term impacts that could radically alter the sustainability of resources and social fabric that make the Plateau what it is.

In managing the largest land base on the Plateau, Bureau of Land Management (BLM) Field Offices located on the Plateau formed a Managers Group Coalition in 1997. The establishment of this "ground-level" coalition, is intended to allow BLM to begin to look at and coordinate land and resource management issues which are becoming increasingly more regional in nature. The Coalition also hopes that by combining their collective voices, BLM resource management on the Plateau will have a stronger voice in competing for diminishing fiscal resources available to BLM at the national level, and in dealing consistently with the vast array of agencies, interest groups and publics involved with the Plateau.

BACKGROUND

The Managers Coalition realized early on that one of the primary factors necessary for effective long-term land management was the ability to have access to regional data and be able to access and apply the results of current scientific research in the fields of physical, biological and socio-economic disciplines. A great deal of information and research has been conducted across the Plateau, but is not always readily available to remote Field Offices. Additionally, as new land management pressures and issues surface, requirements for new research and data may shift.

To begin to address these research and data needs on a regional level, the Managers Group Coalition created a Science Committee to assist them in identifying needs and providing recommendations. This Committee consists of a core group of BLM resource specialists that work on the Plateau, in addition to ad hoc committee members representing the four BLM State Offices on the Plateau, the National Applied Resource Service Center, and the Washington Office. The Coalition subsequently tasked the Committee with developing a strategy to address the science and research needs of BLM on the Plateau.

In March 1999, the Committee initiated this effort by querying all Field Offices on the Plateau as to data and research needs they required to address issues in their respective areas. Seventy one proposals were received from nine Field Offices. These proposals consisted of data acquisition, monitoring, and both short and long-term research needs. Several of the needs identified were duplications or slight variations of the same theme, such as pinyon-juniper research and GIS data bases. The Science Committee reviewed and summarized these needs and prepared the following research, information and data needs catalog.

The attached catalog contains three sections. The first section consists a summarization of needs identified from the responding Field Offices, presented by general category and overall priority as established by the Science Committee. Priorities were set, for the most part, based on how many times a topic was listed from the various field offices, and the direct applicability of results from such research or data compilation. The second section is an edited listing of the specific needs identified by each office, and is arranged by Field Office. The third section is a list of BLM Colorado Plateau Science

Committee members, with locations, phone numbers and e-mail addresses, in the event further information is required. The individual specialist who identified a need is also included with Section II, so that those individuals can also be contacted for further information.

SUMMARY

The intent of this endeavor is to prepare a Plateau-wide catalog of research, data and monitoring needs of BLM. This regional catalog will be coordinated with the BLM National Science Strategy as it develops over the next year. Needs will also be forwarded and coordinated with the Colorado Plateau Cooperative Ecosystem Study Unit (CESU), being developed at Northern Arizona University. It is hoped that review of these needs by the scientific community will identify areas of interest by researchers, who may then be willing to conduct necessary research or help in meeting data acquisition needs. Various researchers may also be able to help point the Bureau to past or ongoing research that may address some of these needs, or be willing to modify on-going research project to help address specific topics.

At this time, BLM has no direct line funding for procuring these needs, but efforts are underway to acquire line item funding at the national level to assist in this effort. In the interim, if researchers see an area of interest to their research, they are encouraged to contact either Colorado Plateau Science Committee members, or the individual Field Office specialists identified, for clarification, further questions, or potential for collaborative work in acquiring these needs.

We are hopeful this effort will become part of a yearly program by Colorado Plateau BLM Field Offices, which can lead to a consistent and coordinated effort to collaborate with the scientific community to acquire and utilize the best science available for the management and long-term sustainability of public lands and resources on the Colorado Plateau.

SECTION I

RESEARCH AND DATA NEEDS BY CATEGORY AND PRIORITY

The following summary is grouped by general categories, based on analysis of the proposals identified by the Field Offices. These categories are presented in a general priority of needs across the Plateau as determined by the Science Committee. Where different offices identified the same need (for example, pinyon-juniper research), they are combined and listed only once under the heading. This summarization is intended to give a quick overview of what the overall needs are. Each heading is introduced with a brief discussion, and is followed by a listing of the specific topics as identified in the Field Office submissions.

Comprehensive Plateau-wide Resource Bibliography

A comprehensive bibliographic database of natural resource and socio-economic research are essential to wise resource management. A bibliography needs to be prepared and made easily and readily accessible to all Field Office personnel. It needs to be updated on a routine basis. It could consist of a series of web-linked sources, although that can be cumbersome to utilize. The compilation of such a database would help field specialists and managers answer many questions, by knowing what information was already available.

- Comprehensive bibliographic reference database for all past research on or adjacent to the Plateau.

Comprehensive Regional GIS Database

A compilation of all existing GIS data layers for the region, the main focus being seamless baseline information (i.e., data that crosses state and administrative boundaries), and data base construction with existing information which is essential for analyzing issues on a regional level. This data would be geo-referenced and edge mapped to the extent possible, and placed in an automated location accessible to anyone. It must be usable by non-computer expert staff. Preferable scales would be 1:100,000 and 1:500,000. This data set could be utilized to look at regional level issues, in addition to being used to identifying gaps where additional inventory and data acquisition would provide an accessible spatial database on a general level for the whole region.

- Comprehensive GIS data base for all states on the Colorado Plateau, consisting of available current “base” data layers.

Database Compilation for Ecological Characterization and Analysis

Although not identified as a specific research project, the BLM Colorado Plateau Science Committee team determined that ecological characterization should be a high priority for several reasons. In the short-term, acquisition of the basic data needed for characterization has direct applicability to a host of on the ground needs. This would apply to areas of immediate ecological characterization where data is collected at fine-scales (1:24,000), as well as longer term upscaling of the process and/or efforts to extrapolate results to larger-scale analysis areas (1:500,000 or 1:1,000,000). Additionally, systematic automated databases enhance research efforts by allowing direct comparisons of areas where data has been captured at the same scale. In the long-term, ecological characterization allows a detailed look at how ecologic processes, functions and interactions occur on landscapes across the Plateau. This will allow more confidence in predictive analysis associated with management of developing uses and issues in the region.

- Completion and publication of geologic maps at the 1:100,000 scale.
- Compilation of a digital database of NRCS Order 3 soil surveys.
- An inventory of paleobiological resources cross the Plateau.
- Historic disturbance regimes and ranges of natural variability on the Plateau.
- Current baseline inventory of the natural vegetative communities on the Plateau.

Hydrology and Watershed

There are many issues under this heading requiring research and/or compilation of data. In many regards, most of the research and data proposals have some basis in watershed. We need up to date regional inventory, mapping and classification of streams and channels, research on response of soils and watersheds to development and uses, methods to determine specific causes of coliform increasing in our water supplies, additional climatic data collection instrumentation, more effective mitigation and reclamation techniques, etc.

- A comprehensive inventory of all perennial stream stretches with baseline water quality data.
- Information and data on sediment runoff and water chemistry characteristics from various soils and drainages.
- Development of natural sediment loading model.
- Instream flow needs assessments.
- Analysis of bacterial runoff from livestock, wildlife and human uses.
- Interrelationships of geology, soils and vegetation in arid system riparian areas.
- Identification and definition of the occurrence and movement of ground water in underlying aquifers of the Arizona Strip.
- Inventory of springs, seeps, wells and surface waters on the Arizona Strip.
- Assessment of the potential for shallow perched potable aquifers within a five mile radius of three BLM administrative sites within the proposed national monument on the Arizona Strip.
- Assessment of the effects of the current ponderosa pine restoration projects on infiltration, ground water recharge, and related spring flows and runoff in the Mt. Trumbull area.
- Impacts to aquifer recharge areas from conversion to grass and/or shrubs on the Arizona Strip.
- Stream gaging stations on Price River, Nine Mile and Minnie Maud Creek.

Impact Assessments From Development on the Plateau

With the current trends in resource extraction and development across the Plateau, there is a need for more comprehensive understanding of both short and long-term impacts from this development.

- Geochemical erosional characteristics of the Mancos Shale, and potential impacts to water quality, wildlife, vegetation, and Colorado River salinity.
- Analysis of effectiveness related to rehabilitation/revegetation efforts associated with surface-disturbing actions on the Plateau.
- Erosion and sedimentation study in the San Juan Basin.
- Impacts to aquifers in Emery and Carbon counties from methane gas development.
- Compressor noise analysis, establishment of background noise levels and development of noise level guidelines for rural areas in the San Juan Basin.
- Assessment of spatial relationships of roads, wells, compressors, reliable waters and varying degrees of forage quality, cover, and general vegetation types on the distribution of deer and elk within the Rattlesnake Canyon Habitat Management Plan (HMP) Area.
- Inventory and analysis of timber harvesting operations in upland areas.

Pinyon-Juniper/Vegetation/Exotic Species

Through review and discussion of proposals it was clear that there is a wide array of research needs associated with pinyon-juniper communities. These relate to many areas including, ecology and paleoecology of pinyon-juniper communities, climate influences on distribution, vegetation associated with and dependent upon pinyon-juniper communities, wildlife needs and use patterns of pinyon-juniper forests, fire history, effective treatment methods, and management options and alternatives based on characteristics of pinyon-juniper communities. Pinyon-juniper research was identified in nearly every office response. Exotic species are also an issue across the majority of the Colorado Plateau and should be researched and studied on a broad scale, with species specifically found on the Plateau. Specific needs include continued research into effective management and treatment methods, genetic viability stocking levels for wild horse herds, and better coordination and monitoring of rare plant communities.

- Pinyon and juniper encroachment into sagebrush communities.
- Controlling factors, historical distribution, fire history, and projections of future pinyon-juniper spread on the Colorado Plateau.
- Effective management and treatment programs for invasion of exotic plant species specific to the Colorado Plateau.
- Coordinated rare plant monitoring on the eastern Colorado Plateau.
- Study of historic spatial changes in meadows in the Mt. Trumbull area.
- Compilation and analysis of multi-temporal landsat thematic mapping (TM) images of Mt. Trumbull Ecosystem Restoration Project.

Visitor Impact/Recreation/Socio-economics

Visitor studies across the plateau are essential to understanding not only the expectations that visitors and other users have, but also the physical impacts, in addition to expectations and needs of residents. We also need to know what socio-economic benefits and/or problems result from the rapidly increasing in-migration to the Plateau.

- Impacts to water quality from backcountry human waste.
- Testing for the efficacy of a dry bacteria product to speed the breakdown of human waste in an arid backcountry setting.
- Recreational use patterns, physical, biological and socio-economic impacts from recreationists other than mountain bikers and 4 wheel drivers.
- ATV impacts specific to the Colorado Plateau ecosystems.
- Natural resource base cash flow and areas of economic influence on the Colorado Plateau.
- Visitor use survey on the San Rafael Swell.
- Political, social, economical futuring on the Colorado Plateau.
- Human carrying capacities and environmental thresholds.

Wildlife

Wildlife research needs are varied. They involve proposals related to natural fishery habitats, tracking of species utilizing satellite technology, habitat requirements of several bird species in differing vegetative communities, and impacts to deer and elk from development related habitat fragmentation and impacts to historic habitat areas.

- Inventory of natural or anthropogenic barriers in stream and rivers that support native fisheries on the Colorado Plateau.
- Sagebrush steppe habitat and avian population dynamics.
- Pinyon-juniper woodland habitat and avian population dynamics.
- Desert shrubland habitat and avian population dynamics.
- Affect of percent slope on birds in pinyon-juniper woodlands.
- Effects of common fuelwood harvest practices on pinyon-juniper woodland birds.
- Satellite tracking system for bighorn sheep in southeastern Utah.
- Satellite tracking system for bald eagles across Colorado Plateau.
- Effects of cowbirds on passerine nesting success on the Colorado Plateau.
- Data acquisition for Rosa critical deer and elk habitat, San Juan Basin.
- Genetic viability stocking rates of wild horse herds.

Cultural and Rock Art

Cultural research needs include databases for rock art, impacts to cultural sites from fire, grazing and recreational development, and an inventory and map of pre-historic Native American tribal lands across the Plateau.

- Compilation and consolidation of rock art database on the Colorado Plateau.
- Inventory of native American ethnographies (locations of ancestral lands).
- Impacts and area of influence on cultural sites from developed recreational sites
- Impacts to cultural sites and features from livestock grazing.
- Fire affects on cultural resources on the Colorado Plateau.

Amphibians/Invertebrate

Amphibian and invertebrate populations on the Plateau are poorly understood. We need a baseline inventory and research into habitat areas and requirements, and interactions and importance of amphibians and invertebrate to the overall health of Plateau ecological systems and functions. Are there amphibian or invertebrate species which could serve as indicator species for overall health?

- Amphibian inventory and research across the Colorado Plateau.
- Invertebrate inventory and research across the Colorado Plateau.
- Identification and biology of cave-dwelling (troglobitic) invertebrates on the Arizona Strip

Geologic

Primary geologic needs center around completion of geologic mapping at a scale of 1:100,00, previously identified under baseline ecological database needs. This provides fundamental base data for resource management. Additional site-specific geologic research needs include:

- A chronology of age dates of basalt flows on the Shivwits and Uinkaret Plateaus.
- A study of the distribution of olivine inclusions in basalts on the Shivwits and Uinkaret Plateaus.

SECTION II
SPECIFIC FIELD OFFICE NEEDS

ARIZONA STRIP FIELD OFFICE

Need: **Compilation of a Digital Database from Available Geological, Hydrological and Biological Information for the Proposed Shivwits Plateau National Monument/Conservation Area**
Category: Data acquisition - GIS themes.
Application: To provide base data for management, future research and identification of gaps in information.
Contact: Becky Hammond, Nonrenewable Resources Advisor/Geologist - (435) 688-3323
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **Completion and Publication of Geologic Maps at 1:24000 scale**
Category: Data acquisition - geologic mapping.
Application: Geologic data are one of the fundamental base layers required for analysis and subsequent management of natural resources.
Contact: Becky Hammond, Nonrenewable Resources Advisor/Geologist - (435) 688-3323
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **A Chronology of Age Dates of Basalt Flows on the Shivwits and Uinkaret Plateaus**
Category: Research - geologic and soils.
Application: This data would be used to determine the age of soils across the Arizona Strip and their development sequence. Analysis of age dates on the basalt flows would provide a unique opportunity to study soil genesis from the same parent material over a large span of time. The dense clays of the older soils could also provide clues to climatic changes and other past geological events.
Contact: Becky Hammond, Nonrenewable Resources Advisor/Geologist - (435) 688-3323
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **A Study of the Distribution of Olivine Inclusions in Basalts**
Category: Research - geologic and archaeologic**.**
Application: Distribution patterns of olivine could provide information on the movement and trading patterns of prehistoric peoples who inhabited the area. The olivine is significant because it was used as a temper in Ancestral Puebloan (Anasazi) ceramics in this region.
Contact: Becky Hammond, Nonrenewable Resources Advisor/Geologist - (435) 688-3323
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **Compilation of a Digital Database of NRCS Order 3, 1:24000 Soil Surveys**
Category: Data acquisition - Order 3 soil survey.
Application: Order 3 soil survey data is a critical base data layer for determining a variety of resource values and potential uses and impacts.
Contact: Robert Smith, Soil Scientist/Soil/Water&Air Specialist - (435) 688-3245
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **Study of Historic Spatial Changes in Meadows in the Mt. Trumbull area**
Category: Data acquisition - aerial photography.
Research - vegetation, climate.
Application: To allow study of historic spatial changes in meadows in the Mt. Trumbull area. These changes may be a result of variations in climate, hydrology and vegetation.
Contact: Robert Smith, Soil Scientist/Soil/Water&Air Specialist - (435) 688-3245
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **Compilation and Analysis of Multi-temporal Landsat Thematic Mapper (TM) Images of Mt. Trumbull Ecosystem Restoration Project**

Category: Data acquisition - satellite imagery.
Research - applied use of satellite imagery for resource assessment.

Application: Would allow mid-scale analysis of baseline resource conditions and assist in identifying and analyzing interactions of land treatments conducted by the BLM.

Contact: Becky Hammond, Nonrenewable Resources Advisor/Geologist - (435) 688-3323
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **Identify and Define the Occurrence and Movement of Ground Water in Underlying Aquifers of the Arizona Strip**

Category: Research - hydrologic.

Application: Knowledge of the hydrology of the Arizona Strip is very limited. Knowledge of groundwater and its movement is critical in this arid region and would be valuable in determining impacts from management actions.

Contact: Becky Hammond, Nonrenewable Resources Advisor/Geologist - (435) 688-3323
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **Inventory of Springs, Seeps, Wells and Surface Waters on the Arizona Strip**

Category: Inventory - hydrologic.

Application: Information is needed regarding locations, well logs, flow rates, water quality, recharge area, etc. to make management decisions in a variety of resource programs.

Contact: Becky Hammond, Nonrenewable Resources Advisor/Geologist - (435) 688-3323
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **Information and Data on Sediment Runoff and Water Chemistry Characteristics from Various Soils and Drainages**

Category: Data acquisition - sedimentology and hydrology.

Application: This type of data is needed for ongoing efforts to reduce salinity within the Colorado River system. It would provide fundamental data on areas of highly erosive soils and impacts to salinity from various management actions.

Contact: Robert Smith, Soil Scientist/Soil/Water&Air Specialist - (435) 688-3245
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **Assessment of the Potential for Shallow Perched Potable Aquifers within a Five Mile Radius of Three BLM Administrative Sites within the Proposed National Monument**

Category: Research - hydrologic.

Application: These sites are utilized for administration and research support and available water is very limited. They include the Nixon Administrative/Research Site at Mt. Trumbull, the Parashant Administrative site, and the Poverty Administrative Site.

Contact: Robert Smith, Soil Scientist/Soil/Water&Air Specialist - (435) 688-3245
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **Assessing the Effects of the Current Ponderosa Pine Restoration Projects on Infiltration, Ground Water Recharge, and Related Spring Flows and Runoff in the Mt. Trumbull Area**

Category: Research - hydrologic, vegetative restoration.

Application: This type of information would be useful in developing plans for additional ponderosa pine restoration efforts in other areas on the Strip.

Contact: Robert Smith, Soil Scientist/Soil/Water&Air Specialist - (435) 688-3245
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **Impacts to Aquifer Recharge Areas from Conversion to Grass and/or Shrubs**
Category: Research - hydrologic, vegetative conversion.
Application: Water is very limited on the Arizona Strip. A study to determine if conversion of vegetative cover to grasses and/or shrubs in recharge areas would increase infiltration and potential water yield at Nixon Spring, Poverty Spring and Oak Grove would be beneficial.
Contact: Robert Smith, Soil Scientist/Soil/Water&Air Specialist - (435) 688-3245
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **Causes and Controls of Pinyon-Juniper Encroachment on the Arizona Strip**
Category: Research - vegetative restoration.
Application: The Field Office is interested in the restoration of pinyon-juniper woodlands, which have moved across vast areas of the west. We need fundamental baseline information, analysis of historic distribution patterns and effectiveness of various restoration techniques in order to deal with this increasing distribution pattern.
Contact: Becky Hammond, Nonrenewable Resources Advisor/Geologist - (435) 688-3323
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **An Inventory of Paleobiological Resources on the Arizona Strip**
Category: Inventory - paleobiology.
Application: This type of data would help determine Quaternary climatic changes and the impacts or lack thereof from past and current land use practices. This knowledge would enhance our future management of the public lands.
Contact: Becky Hammond, Nonrenewable Resources Advisor/Geologist - (435) 688-3323
345 East Riverside Drive, St. George, Utah 84790-9000

Need: **Identification and Biology of Cave-Dwelling (Troglobitic) Invertebrates on the Arizona Strip**
Category: Research - Invertebrates.
Application: Cave-adapted millipedes and spiders have been observed in at least two caves on the Arizona Strip. Preliminary identification by a prominent cave biologist (Dr. William Elliot) suggests that the millipedes may be a new species. Describing a new species would benefit the sciences of biology, zoology, ecology and speleology. If the species are indigenous to the Strip, they could be candidates for listing as Threatened or Endangered.
Contact: Matthew Safford, Outdoor Recreation Planner - (435) 688-3200
345 E. Riverside Dr., St. George, UT 84790-9000

FARMINGTON FIELD OFFICE

Need: **Erosion and Sedimentation Study in the San Juan Basin**
1. Determine the average rate of geologic or natural erosion (baseline) generally associated with the San Juan Basin in tons per acre per year.
2. Determine the average rate of geologic and accelerated (man induced) soil erosion contributed by or associated with roads in tons per acre per year.
3. Determine the average rate of geologic and accelerated soil erosion related to the predominate soils types associated with a chosen study area.
4. Determine the rate of sedimentation in area river systems in tons per acre foot per square mile per year, and the impacts on the water quality of area perennial river systems.
5. Determine measures for mitigating impacts to accelerated soil erosion and sedimentation.

Category: Research - watersheds, sedimentology.

Application: The massive gas development currently underway in the San Juan Basin has the potential to add significantly to soil erosion in the region and could have significant impacts on soil erosion and sedimentation above and beyond the existing conditions that are now evident. We need to clearly understand impacts and develop appropriate mitigation techniques.

Contact: Dale Wirth - (505) 599-6320
1235 LaPlata Highway, Suite A, Farmington, New Mexico 87401-8731

Need: **Data Acquisition for Rosa Critical Deer and Elk Habitat, San Juan Basin**

1. Satellite imagery for delineating and quantifying the vegetation types and disturbances such as wells, roads, pipelines and compressor sites.
2. Vegetation studies that characterize the condition and relative abundance of the key browse species within each vegetative type.
3. Pellet group transects within each vegetation type to determine the use period and relative degree of use.
4. Vegetative cover at each of the study sites.
5. Big game survey data collected during the winter plotted on vegetation type maps along with the pellet group use data.

Category: Data acquisition - wildlife, vegetation, mineral development.

Application: The intent of this data collection effort is to quantify the various vegetation types being used by wildlife and these type's location, and condition, relative to various densities of natural gas development (wells/miles of road per square mile). Information gained from this effort will be used in the planning of future gas development.

Contact: John Hansen - (505) 599-6325
1235 LaPlata Highway, Suite A, Farmington, New Mexico 87401-8731

Need: **Compressor Noise Analysis, Establishment of Background Noise Levels and Development of Noise Level Guidelines for Rural Areas in the San Juan Basin**

Category: Research - mineral development.

Application: With the number of compressors being installed and the increase of residents moving into rural areas, BLM is receiving increasing complaints from the noise associated with the compressors. Presently, BLM has no guidelines regarding decibel levels for compressor units at established distances. Establishing guidelines will give BLM a more uniform approach to mitigating impacts from compressors.

Contact: Ruben A. Sanchez - (505) 599-6319
1235 LaPlata Highway, Suite A, Farmington, New Mexico 87401-8731

Need: **Assessment of Spatial Relationships of Roads, Wells, Compressors, Reliable Waters and Varying Degrees of Forage Quality, Cover, and General Vegetation Types on the Distribution of Deer and Elk within the Rattlesnake Canyon Habitat Management Plan (HMP) Area**

1- To what degree does the quality of forage, type or amount of cover, and distance to water over-ride a deer or elk's fear of human disturbance such as roads, wells or compressors?
2- What measures (if any) can be used to mitigate the impacts of the proposed Mesa Verde in-field drilling program, with respect to deer and elk habitat?
3- Is there a threshold of development beyond which deer and elk numbers (relative to the potential of the habitat) will decline? Can this threshold be accurately defined? Can the decline in deer or elk numbers due to natural gas development be accurately predicted?

Category: Research - wildlife, mineral development.

Application: This type of study will provide information for decision-making and resource allocation for management of the deer and elk habitat and appropriate level of oil and gas development.

Contact: John Hansen - (505) 599-6325
1235 LaPlata Highway, Suite A, Farmington, New Mexico 87401-8731

GRAND JUNCTION FIELD OFFICE

Need: **Sagebrush Steppe Habitat and Avian Population Dynamics**

- Identify the minimum patch sizes needed by area-sensitive sagebrush bird species, as measured by reproductive success.
- Investigate how other habitat factors may affect sensitivity (such as structural stage, adjacent land cover types).
- -. Examine the negative consequences of habitat fragmentation that have been documented in other habitat types, such as increases in nest predation or cowbird parasitism rates.
- -. Test the effects on sagebrush birds of different management prescriptions, including prescribed burns and different grazing regimes.
- Investigate reported efficacy of the herbicide “Spike” (Tebuthiuron) in thinning sagebrush to 15-20% canopy cover while preserving forbs.

Category: Research - vegetation, wildlife.

Application: This type of research and monitoring would assist BLM in long-term management of avian habitat in sagebrush steppe habitats, in order to assure sustainability of habitat.

Contact: Ron Lambeth, Wildlife Biologist - (970) 244-3000
2815 H Road, Grand Junction, Colorado 81506

Need: **Pinyon-Juniper Woodland Habitat and Avian Population Dynamics**

- Research the general natural history of the priority pinyon-juniper bird species including: breeding biology, foraging biology (is species important in limiting number of devastating insects in pinyon), and habitat requirements.
- Determine habitat selection parameters to assess how fuelwood harvest may affect the Black-chinned Hummingbird.
- Based on the flower phrenology that sustains the Black-chinned Hummingbird through its Nearctic season: could livestock grazing systems be designed to assure adequate nectar sources through the summer season. Site rehabilitation mixes should have the information that could help to bolster flower species that are needed during the leanest nectar periods.
- Determine the effects of cowbird parasitism on Black-chinned Hummingbirds, Gray Flycatchers, Gray Vireos, Juniper Titmice, and Black-throated Gray Warblers.
- Determine conditions that lead to excessive parasitism and predation failure in nesting of pinyon-juniper birds: vireos, including Gray and Plumbeous, are known to not be able to raise their own young when there's a cowbird chick around, but how likely is this to be threatening to a population? Are nest mites more common in closed canopy than open canopy pinyon-juniper, lightly grazed than heavily grazed sites? What level of human presence brings in the jays and drives out the Cooper's Hawks resulting in more nest predation? (This raises a lot of Watchable Wildlife concerns that need studying.)
- Test the hypothesis that Gray Vireo habitat can be created by stand thinning.
- Research the general natural history of the Juniper Titmouse including: breeding biology (Does the species form permanent pair bonds? Do they defend territories throughout the year?) foraging biology (Is species important in limiting number of devastating insects in pinyon?), and habitat requirements.
- Determine habitat selection parameters to assess fuelwood harvest affect on Juniper Titmouse.

Category: Research - vegetation, wildlife.
Monitoring - vegetation, wildlife.

Application: This type of research and monitoring would assist BLM in long-term management of avian habitat in pinyon-juniper woodland habitats, in order to assure sustainability of habitat.

Contact: Ron Lambeth, Wildlife Biologist - (970) 244-3000
2815 H Road, Grand Junction, Colorado 81506

Need: **Desert Shrubland Habitat and Avian Population Dynamics**

1. Support the investigation of the herbicide OUST for cheatgrass control.
2. Study the mortality of desert shrubland bird species in Colorado and on winter ranges.
3. Determine the feasibility of re-introducing priority species (Loggerhead Shrike, Burrowing Owl) to habitats that appear to have recovered.

Category: Research - vegetation, wildlife.

Application: This type of research and monitoring would assist BLM in long-term management of avian habitat in desert shrubland habitats, in order to assure sustainability of habitat.

Contact: Ron Lambeth, Wildlife Biologist - (970) 244-3000
2815 H Road, Grand Junction, Colorado 81506

Need: **Affect of Percent Slope on Birds in Pinyon-Juniper Woodlands**

Fuelwood sales and vegetation conversion projects occur most often on relatively level ground. The effect of wildfire last longer on level ground. These events greatly change habitat characteristics of the site for wildlife. The wildlife species that prefer or require late seral pinyon-juniper woodland (PJ) are reduced or eliminated from sites that experience those events. There is a question as to whether there will always be plenty of good PJ habitat remaining for these species on the steeper ground. Can the relatively level ground be sacrificed to habitat changing uses without impacting populations on a landscape scale? Or are the relatively level, more productive PJ sites critical to some PJ-obligate species? Currently there are demands to restore mule deer populations West-wide. PJ woodland is a popular target for measures to restore deer populations, while gaining livestock forage benefits too. Calls to let wildfires burn in PJ are becoming stronger. As action on these demands accelerate, studies to determine affects on other wildlife grow more urgent.

Category: Research - vegetation, wildlife.
Monitoring - vegetation, wildlife.

Application: Environmental assessments on these habitat altering projects without this information must speculate on cumulative affects. To our knowledge, no studies have addressed this question, although some existing studies should help to fill gaps in the information base of this study.

Contact: Ron Lambeth, Wildlife Biologist - (970) 244-3013
2815 H Road, Grand Junction, Colorado 81506

Need: **Effects of Common Fuelwood Harvest Practices on Pinyon-Juniper Woodland Birds**

The dominant forestry exercised in pinyon pines and/or juniper trees (PJ) is fuelwood sales and to lesser extent postwood sales. Fuelwood harvesting leaves areas in conditions varying according to the sale stipulations and level of compliance. However, several wildlife species are PJ obligates and other species require a certain density of trees. Sales of wood materials should have advice on stipulation designs. What is the maximum thinning that can occur and still maintain PJ woodland species? Does this vary with the elevation or some other factor? At what dimension does patch size matter? What is the affect on birds of scattering slash versus piling it? How significant are ips beetle control measures common to forestry practice to woodpeckers, cavity nesters, and other birds? There are informative publications on PJ conversions on wildlife including birds and there is a good bibliography on birds and forestry practices in other forest types, but we know of no study closely paralleling this proposal in the PJ zone.

Category: Research - vegetation, wildlife.

Application: Environmental assessments on these habitat altering projects without this information are weak with speculation on the cumulative affects. To our knowledge, no studies have addressed this question, although some studies should help to fill gaps in the information base of this study.

Contact: Ron Lambeth, Wildlife Biologist - (970) 244-3013
2815 H Road, Grand Junction, Colorado 81506

GRAND STAIRCASE - ESCALANTE NATIONAL MONUMENT

Need: **Pinyon and Juniper (PJ) Encroachment into Sagebrush Communities**

Many factors have led to the increase in the density of PJ throughout the West. What has precipitated are vast areas once dominated by sagebrush, sagebrush/grasslands are now dominated by PJ. As PJ increases in density less opportunity exists for palatable, more desirable species to occupy the landscape. Wildlife species dependent on the forage in a sagebrush community lose grass, forbs, and browse species to the encroachment of PJ. Specific to the GSENM, sage grouse lose nesting, foraging, and breeding habitat. Big game species (deer, elk) lose grass, forbs and browse species necessary for their subsistence. Other passerine and small mammal species that are dependent on the sagebrush community are also negatively impacted. .

Category: Research - vegetation.

Application: The implementation and completion of such a project would allow land mangers more opportunity to maintain and/or restore wildlife populations that are tied to the sagebrush community. More forage would be available to a variety of wildlife species.

Contact: Harry Barber, Wildlife Biologist (435) 644-4311
Paul Chapman, Resource Advisor (435) 644-4309
Kanab Headquarters, 180 W. 300 N. , Kanab, Utah 84741

Need: **Impacts to Water Quality from Backcountry Human Waste**

Increasing levels of human waste and the detrimental effects on water quality along the Paria River Corridor are resulting in an escalation in coliform bacteria and parasitic organisms. As yet, research has not been conducted regarding human feces potential contribution to the problem, or how to manage human waste in a wilderness area. The Paria Canyon is not alone in the problem of what to do with human waste in remote areas. All of the southwestern region's public land agencies, including the National Park Service, are experiencing the same kind of problems. No comprehensive region wide research has been done, and no viable solution identified.

Category: Research - hydrology (water quality impacts)

Application: Water quality is an issue that every American is concerned about. Many of these wilderness areas are watersheds for public water systems. Water contamination due to humans is far more deadly than contaminants from livestock. The applications of this research would benefit not just wilderness users, but all water users.

Contact: Marietta Eaton, Assistant Monument Manager/Physical and Cultural Sciences - (435) 865-5114
Kanab Headquarters, 180 W. 300 N. , Kanab, Utah 84741

Need: **Consolidation of Rock Art Data on the Colorado Plateau**

Rock art across the Colorado Plateau is deteriorating at an alarming rate from natural causes, damage and vandalism. Visitation across the regions is increasing. The rock art sites of the Colorado Plateau are world class heritage resources. Many local manifestations (i.e. Barrier Canyon, San Juan, Fremont) have been studied in detail, but that information is not readily available or connected. No consolidated database has ever been suggested.

Category: Inventory - archaeology.

Application: A database of rock art sites will facilitate a greater understanding of this resource, therefore allowing us to manage them more effectively. Documentation and database development will help BLM meet NHPA requirements for both Section 106 and Section 110. Tribal relationships could be enhanced by sharing this information with local tribal groups. It would also enable BLM to evaluate conservation needs across the Plateau and focus on the most threatened sites each year for documentation and conservation.

Contact: Marietta Eaton, Assistant Monument Manager/Cultural and Earth Sciences - (435) 865-5114
Kanab Headquarters, 180 W. 300 N. , Kanab, Utah 84741

MOAB FIELD OFFICE

Need: **Satellite Tracking System for Bighorn Sheep in Southeastern Utah**

The effects of human encroachment on Bighorn sheep habitat is poorly documented and understood. As a result, bighorn sheep are abandoning historic use areas for reasons we can only speculate. This type of research project would study the potential for utilizing satellite technology to help establish displacement causes, length of displacement from various disturbance activities, use behavior patterns, genetic characteristics and population interactions, and long-term effects of disturbance on populations. The use of satellites for tracking would greatly enhance the collection of data, compared with older standard radio-telemetry methods.

Category: Research - wildlife.
Data acquisition - wildlife.
Monitoring - wildlife.

Application: This type of data would help determine disturbance related impacts to populations, and would allow long-term management programs to assure sustainability for herds. Such information could be useful across the entire Colorado Plateau wherever Bighorn sheep are found.

Contact: Joe Cresto, Wildlife Biologist - (435) 259-2114
82 East Dogwood Ave, Moab, Utah 84532

Need: **Satellite Tracking System for Bald Eagles across Colorado Plateau**

The migratory interactions between bald eagle populations is poorly documented and understood. This type of research project would utilize satellite technology to help establish interaction characteristics between populations, seasonal movement patterns, use behavior patterns, genetic characteristics, and long-term effects of disturbance on populations. The use of satellites for tracking would greatly enhance the collection of data, compared with older standard radio-telemetry methods.

Category: Research - wildlife.
Data acquisition - wildlife.
Monitoring - wildlife.

Application: By better understanding of population interactions, this type of data would help refine management for disturbance related impacts to populations, and would allow long-term management programs to assure sustainability. Such information could be useful across the entire Colorado Plateau wherever Bald eagles are found.

Contact: Joe Cresto, Wildlife Biologist - (435) 259-2114
82 East Dogwood Ave, Moab, Utah 84532

Need: **Effects of Cowbirds on Passerine Nesting Success on the Colorado Plateau**

Many migratory bird species show a downward population trend. Currently, it is believed that grazing and agriculture attract cowbirds, resulting in more parasitism, and that grazing and recreation use "open" an area so that is easier for cowbirds to find passerine victims. While some research into this interaction is occurring, we still do not know the extent of this problem.

Category: Research - wildlife.

Application: A better understanding of these interactions would help refine management for disturbance related impacts to populations, and would allow long-term management programs to assure sustainability. Such information could be useful across the entire Colorado Plateau for grazing and recreation management.

Contact: Joe Cresto, Wildlife Biologist - (435) 259-2114
82 East Dogwood Ave, Moab, Utah 84532

Need: **Controlling Factors, Historical Distribution, Fire History, and Projections of Pinyon-Juniper Invasion on the Colorado Plateau**

What is currently known regarding pinyon-juniper vegetation on the Colorado Plateau?. What were historical, pre-European patterns of distribution and spread? What soil, geographic, climatic or human caused factors influence spread distribution? What are projections for additional spread in the future? What are impacts to watersheds, vegetation patterns, soils, and wildlife species from additional distribution? What were historical burn intervals? How did these differ between sites? What did the historical vegetation community look like (i.e., understory species and density of trees vs shrubs and herbaceous species)? What methods would work best for control? What should natural distribution patterns look like?

Category: Research - vegetation, fire history.

Application: Pinyon-juniper distribution appears to be rapidly spreading across the Plateau. This spread is resulting in less vegetation on public lands for wildlife and livestock, and is decreasing vegetative diversity on the landscape. There may also be other long-term impacts we are currently unaware of, which could either be beneficial or adverse. With the knowledge that could come from such research, we would be in a better position to know what natural distribution patterns should be, what the impacts from P-J stands are to a landscape, and better methods for control and management.

Contact: Joe Cresto, Wildlife Biologist (435) 259-2114.
82 East Dogwood Ave, Moab, Utah 84532

Need: **Effective Management and Treatment Programs for Invasion of Exotic Plant Species Specific to the Colorado Plateau**

The Colorado Plateau has the same need for this type of research as all other western states. We are quickly losing productivity of rangelands and diversity of vegetation on public lands. Wildlife populations are being impacted, some adversely, some beneficially. What exotic species are specific to the Plateau, how rapidly do they spread, what conditions result in their spread, are they all adverse, and can they be effectively controlled?

Category: Research - vegetation.
Data acquisition - vegetation.

Application: This type of research would be specific to our region, and will greatly enhance efforts at control and management of these species.

Contact: Joe Cresto, Wildlife Biologist - (435) 259-2114
82 East Dogwood Ave, Moab, Utah 84532

Need: **Interrelationships of Geology, Soils and Vegetation in Arid System Riparian Areas**

There is a need to know what the actual interrelationships are between geologic formations, soil types and corresponding vegetation types in riparian zones in arid ecosystems. How do various soil types control vegetation patterns? How are soil types and erosive regimes related? How does geologic structure affect erosion patterns? What types of soils are developed on differing geologic bedrock? What chemical and physical properties of soils provide controlling factors? Can vegetation control soil development?

Category: Research - geology, soils, vegetation.

Application: With the expanding uses and interests in public lands, we need a better understanding of impacts to riparian areas, particularly since recreationists tend to congregate in these areas on the Plateau. This type of data and research would aid in conducting Proper Functioning Condition assessments. It would allow us to determine if vegetation features in a given area could be improved, or if based on soil conditions present, are at their optimum conditions.

Contact: Anne-Marie Aubry, Hydrologist - (435) 259-2173
82 East Dogwood Ave, Moab, Utah 84532

Need: **Impacts and Area of Influence on Cultural Sites from Developed Recreational Sites**

How much actual area is impacted from the development of recreation sites, beyond the actual site. We know that campers and recreationists don't just camp at public facilities, but also have a tendency to "wander" around the site on short hikes, walking pets, looking for unique features, relaxing, using the "bathroom", etc. Therefore, impacts from developing a site often exceed the area of actual disturbance for construction of facilities. In relation to this use, how far away from actual disturbance areas should cultural inventories be conducted? Would this area of influence be related to the primary type of recreational use the site is developed for (i.e., trailheads for hiking and backpacking areas, or campgrounds for ATV use?

Category: Research - archaeology, recreation.

Application: With the exploding use of all types of recreational activities on public lands, we need a better understanding of impacts to cultural sites, and more specifically, how broad an area needs to be cleared culturally. This type of information could help reduce costs of survey and inventory work and could help in the siting of recreational facilities.

Contact: Bruce Louthan, Archeologist - (435) 259-2154
82 East Dogwood Ave, Moab, Utah 84532

Need: **Impacts to Cultural Sites and Features from Grazing**

There is a need to know what the actual impacts are to archeological sites from grazing, more specifically the impacts from livestock. This has been an issue for a number of years in the Four Corners area, and was more recently brought to the forefront again with the Comb Wash issue in southeastern Utah. Do livestock actually destroy surface sites? To what extent can they impact a surface site? Do livestock destroy archeological structures?

Category: Research - archaeology, grazing.

Application: With the expanding uses and interests in public lands, we need a better understanding of impacts to cultural sites from livestock grazing. BLM is frequently challenged by appellants with this issue, and data and research could answer this question and help resolve this issue.

Contact: Bruce Louthan, Archeologist - (435) 259-2154.
82 East Dogwood Ave, Moab, Utah 84532

Need: **Fire Affects on Cultural Resources on the Colorado Plateau**

With the national and departmental emphasis on prescribed burns to return landscapes to natural burn patterns and intervals, combined with the volume of cultural artifacts and sites scattered across the Plateau, we need a better understanding of fires effect on these resources.

Category: Research - archaeology, fire.

Application: We currently know little about such impacts. What types of sites are unaffected by fire, and what types of sites are adversely impacted by fires? Are there secondary impacts from fires to cultural resources such as increased sedimentation and erosion? This type of research and knowledge would reduce time and eliminate guesswork for analysis of impacts to cultural sites when performing Environmental Assessments. It would help identify areas that should or should not be burned. It would also help provide documentation and defense of burn plans when they are appealed by environmental groups.

Contact: Bruce Louthan, Archeologist - (435) 259-2154
82 East Dogwood Ave, Moab, Utah 84532

Need: **Recreational Use Patterns, Physical, Biological and Socio-Economic Impacts from Recreationists Other Than Mountain Bikers and 4 Wheel Drivers**

Minimal data exists related to recreational user groups (such as backpackers, ATV'ers, river runners, extreme sporting enthusiasts, horse back riding, etc). Information is required related to specific use patterns, types of experiences expected, types of land designations required, where are they coming from, how far will they travel, how many dollars do they put into local economies, what types of areas do they seek out, what types of services do they want or require, and what types of fees are they willing to pay. Additionally, we need better data on what types of impacts these uses have to wildlife, riparian areas, watersheds, etc.

Category: Research - recreation, socio-economics.

Application: With the exploding use of all types of recreational activities on public lands, we need a better understanding of needs and desires of these recreationists, what level of interactions with other public land users are acceptable to them, and what the requirements are for services and facilities. By understanding these needs, BLM could refine management for various areas, and would allow long-term management programs to assure sustainability.

Contact: Russ Vonkoch, Resource Advisor/Recreation and Cultural Resources - (435) 259-2116
82 East Dogwood Ave, Moab, Utah 84532

Need: **Comprehensive Inventory of all Perennial Stream Stretches with Baseline Water Quality Data**

Water quality may be the key component of healthy landscapes. Water quality monitoring is done on a statewide basis by a host of federal and state agencies with often times differing needs. Sampling is either random or directed toward known problem watersheds. There is no systematic, all encompassing inventory and database for all perennial streams. There is minimal coordination on regional basis, and many watersheds cross state boundaries.

Category: Data Acquisition - hydrology.

Application: With expanding use and interest in public lands, we need a shared, comprehensive database regarding water quality to assure long-term quality is maintained and problem areas are addressed. It would allow regional coordination and emphasis on the biggest problem areas, and would result in savings in the watershed assessment and restoration programs. This type of data is required: to 1) provide current regional baseline data, 2) to allow long-term monitoring, 3) to allow identification of problematic watersheds and causes, and 4) to allow coordination of watershed assessment and restoration on a systematic, regional basis.

Contact: Ann Marie Aubry, Hydrologist - (435) 259-2173
82 East Dogwood Ave, Moab, Utah 84532

Need: **Effective Vegetative and Physical Reclamation Techniques on the Colorado Plateau, and a Bibliography of Past Research**

Increasingly, programs are initiated for restoration of abandoned minesites and watersheds. The Colorado Plateau has a unique assemblage of soil and vegetation types, combined with unique climatic and precipitation patterns. What vegetative species have the best chance of survival if used in reclamation given these characteristics? Is it better to use native species, which are more difficult and expensive to acquire and work with, or are there non-native species that may work without adverse impact? Should vegetative species be acquired from local areas so that they are acclimated to local climatic patterns? What types of soil characteristics govern success, or require additional treatment prior to revegetation?

Category: Data acquisition - bibliography.
Research - reclamation.

Application: This type of information would greatly enhance efforts at reclamation, resulting in cost savings in time and materials, and result in enhanced success of reclamation.

Contact: Rich McClure, Natural Resource Specialist - (435) 259-2127
82 East Dogwood Ave, Moab, Utah 84532

Need: **Comprehensive GIS Data Base for All States on the Colorado Plateau, Consisting of "Base" Data Layers**

For addressing issues on a regional landscape level, we must have readily available common GIS databases across the region. A system is required that collects all available GIS data, from a variety of sources, that are currently available on the Plateau. This available data needs to be geo-referenced and edge mapped across jurisdictional and geopolitical boundaries wherever possible. The resultant data base then needs to be readily accessible and "user friendly" to potential users.

Category: Data acquisition - GIS data themes.

Application: Not all issues on public lands require regional analysis or solutions, but as users become increasingly more mobile, utilizing multiple sections of the Plateau for recreation or economic development, certain issues will require regional solutions. We need access to effective tools that allow us to begin to look at regional long-term cumulative impacts, and how various issues, which may initially appear to be local, may in fact be creating regional impacts. This type of readily accessible, regional GIS information, would greatly enhance our efforts to sustainably manage the natural resources under our jurisdiction, in a manner that is regionally consistent where it needs to be. It would also allow us to readily identify where data gaps occur, would help eliminate duplication of data acquisition, and allow completion of efforts to acquire all relevant data.

Contact: A. Lynn Jackson, Resource Advisor/Science and Outreach - (435) 259-2150
82 East Dogwood Ave, Moab, Utah 84532

Need: **Colorado Plateau Invertebrate Inventory and Research**

Invertebrates are the most abundant and often the most important consumers in many terrestrial and aquatic ecosystems. They perform critical ecosystem functions involved in energy exchange, facilitate decomposition, pollinate flowers, disperse and prey on seeds affecting plant community structure, redistribute nutrients and energy between aquatic and terrestrial systems, and regulate availability of nutrients to producers. Despite their importance in maintaining functioning ecosystems, invertebrates are typically poorly understood, and in most ecosystems have not even been fully inventoried. Because invertebrates are critical for proper ecosystem functioning, they are excellent tools for monitoring ecosystem health. Although there may not be current identified issues related to invertebrate species on the Plateau, they form a base for much of the natural foodchain. It would be wise to consider initiating baseline inventory of select species. What roles do invertebrates play in the function of ecosystems in our region? What effect do various invertebrate species have on native populations of plant species? Are there symbiotic relationships we are unaware of? Are there invertebrates that can be used for natural control of exotic species? What invertebrates species would provide a resource for monitoring changes in ecologic functioning?

Category: Inventory - invertebrates.
Research - invertebrates.

Application: Complete ecosystem management for sustainability requires we take into account all physical and biotic interactions within a system. This type of research may provide critical baseline information affecting decisions at some point in the future.

Contact: Tim Graham, PhD/Ecologist - (435) 259-2109
USGS/BRD - Canyonlands Field Station
82 East Dogwood Ave, Moab, Utah 84532

Need: **Amphibian Research Needs on the Colorado Plateau**

There is an enormous array of aquatic/riparian habitats across the Plateau, from alpine ponds to montane meadows and streams, semi-arid and arid creeks and intermittent streams, and ephemeral pools such as potholes, tinajas, and playas. Each has its suite of amphibians as well as potential and actual threats. Basic information is needed related to habitat requirements, function within various systems, etc. The following questions are identified:

1. Inventories of species present.
2. Investigation of best methods for surveying amphibians in these environments, especially what data can be used to develop long term monitoring programs.
3. Research into the effects of livestock on amphibians. This does not mean just the impact of removing vegetation, i.e., grazing, but the full impact of the presence of livestock, especially when they are present during breeding, such as higher elevation sites, and ephemeral pools at low elevations where livestock are kept through spring (some allotments have cattle until June, even some below 1500 m). Are there impacts to amphibians in riparian corridors from removal of vegetation, change in plant species composition or the 3-D structure of the habitat, or trampling of metamorphs? How have the proliferation of stock ponds across landscapes affected population structure of amphibians, especially spadefoot toads. Have these ponds allowed other species (e.g., bullfrogs) to gain a hold in areas they would not otherwise be able to survive in, and do bullfrogs thus affect other species in these habitats?
4. Research into the impacts of vehicular and non-vehicular recreation in cañon riparian ecosystems on amphibians. Recreational activities are increasing exponentially on the Plateau, and much of the activity is concentrated in narrow cañon bottom riparian systems.
5. Bullfrog distribution, rate of spread, and impact this species has had on native frog and toad populations in various environments. Is it spreading along major rivers and then into side drainages? Is it dispersing along the shores of Lake Powell to previously isolated drainages?
6. Are there relict populations of some frogs, toads or the tiger salamander in cañons now isolated from each other by Lake Powell, or by changes in the flow regime of the Colorado River below Glen Canyon Dam, or flow changes of other rivers brought about by various management actions such as irrigation diversions, etc.?
7. Do hanging gardens provide a significant amount of, or critical stepping stone, habitat for any species of frog or toad (or the tiger salamander)?
8. Is the tiger salamander on the CP genetically distinct? Are any of the frog or toad populations, perhaps on isolated mountains etc., distinct?

Category: Inventory - amphibians.
Research - amphibians.

Application: Fundamental information on amphibian species present, their distribution, function, response to disturbance, etc., is required in order to fully understand ecologic systems across the Plateau. This information is also required to assess impacts to amphibian populations and potential corresponding impacts throughout the system from management decisions.

Contact: A. Lynn Jackson, Resource Advisor/Science and Outreach - (435) 259-2150
Tim Graham, PhD/Ecologist - (435) 259-2109
USGS/BRD - Canyonlands Field Station
82 East Dogwood Ave, Moab, Utah 84532

Need: **Comprehensive Bibliographic Reference Database for All Research on or Adjacent to the Colorado Plateau**

Field Offices do not have easy or readily available "across the board" access to results of past research, or information related to current research, that is pertinent to the management recommendations we make. The majority of our field staff do not have the time to acquire this information, nor the means to access this type of information.

Category: Data acquisition - bibliography.

Application: Ready access to a comprehensive bibliography, dealing with all facets of scientific knowledge (biological, physical, and socio-economic) on the Plateau, would greatly enhance efforts to wisely and sustainable manage the natural resources under our jurisdiction. It would result in enhanced research savings by assuring duplication does not occur over time.

Contact: A. Lynn Jackson, Resource Advisor/Science and Outreach - (435) 259-2150.
82 East Dogwood Ave, Moab, Utah 84532

MONTICELLO FIELD OFFICE

Need: **Testing for the Efficacy of a Dry Bacteria Product to Speed the Breakdown of Human Waste in an Arid Backcountry Setting**

There has been an increase in backcountry recreation in the Four Corners region and concomitant adverse impact caused by increasing human waste levels on water quality, canyon riparian zones, and backcountry primitive recreation sites. Land managers recommend the "cat hole" method of human waste disposal (burying human stool 6" below ground level and letting natural breakdown to occur) in these areas. A product now exists consisting of human waste-specific dry bacteria, encapsulated in water soluble plastic, and activated by water (urine) to increase the rate of breakdown. Research is needed on how this product works, whether it significantly enhances human waste breakdown, any contraindications, and ways to optimize its remediation effect.

Category: Research - watershed, soils, recreation.

Application: This type of information would allow land managers to consider the use of the product by recreationists and could greatly decrease the human waste pollution in backcountry areas if the product is found to be effective and environmentally acceptable.

Contact: Philip A. Gezon, Outdoor Recreation Planner - (435) 587-1519
P.O. Box 7, Monticello, Utah 84535

PRICE FIELD OFFICE

Need: **Rosgen Channel Classification Inventory and Assessment**

Complete inventory and classification of all surface hydrography according to Rosgen's stream classification system. Mapping at assessment Levels I can be done from existing topographic maps. Mapping at Level II can be completed through compiling data from Riparian Functioning Condition assessments and Rangeland S&G's if they have been properly conducted, otherwise some field level data collection would be required.

Category: Inventory - hydrology, geomorphology.

Application: The purpose of this would be multi-fold. Current PFC's and Rangeland S&G assessments require this classification. However, most field offices within the Plateau are not equipped to make such assessments, and have therefore guessed at this important classification. Once such data is compiled, the reaction of stream channels to disturbance and the response of those same channels to mitigation would be predefined. This would ensure our current assessments are conducted correctly, and eliminate much of the trial and error involved in restoration planning and management

of channels in general. This same inventory would allow us to differentiate between existing natural drainages and those erosion gullies which were caused by past mismanagement, negligence, and poor planning/design. This inventory would also facilitate use of a natural sediment loading model.

Contact: Kerry Flood, Hydrologist - (435) 636-3617
125 South 600 West, Price, Utah 84501

Need: **Inventory and Analysis of Timber Harvesting Operations in Upland Areas**

We are experiencing greater activity in timber harvesting from private lands interspersed within, and often times upland, of public lands. More often than not, this activity is not properly evaluated or regulated, resulting in potential for tremendous damage to downstream watershed resources, i.e., soils, sedimentation, water quality and quantity, wildlife habitat, vegetation, etc. We need a current satellite or aerial photo inventory of where these private cuts have taken place in the past and where they are currently taking place.

Category: Inventory - forestry, watershed, hydrology.

Application: This will allow us to attempt to coordinate with state timber agencies and possibly the timber companies to allow monitoring data above and below these locations. It would help pinpoint areas where specific watershed damage was occurring and allow for opportunities for collaborative mitigation and/or elimination of those downstream impacts.

Contact: Kerry Flood, Hydrologist - (435) 636-3617
125 South 600 West, Price, Utah 84501

Need: **Stream Gaging Stations on Price River, Nine Mile and Minnie Maud Creek**

Category: Data collection - hydrology.

Application: Due to funding cuts, stream gaging stations are no longer located on these streams. Stream flow data is integral to defining and analyzing important resource issues in the watersheds of each river. Water flow data is critical to any base resource analysis, monitoring and long-term planning. We need to find a way to assist in getting these stations back on line.

A cooperative database could be developed (online) for the collection of flow data from the many sources which currently exist.

Contact: Kerry Flood, Hydrologist - (435) 636-3617
125 South 600 West, Price, Utah 84501

Need: **Development of Natural Sediment Loading Model**

Category: Research - hydrology, soils.

Application: The Clean Water Act placed deadlines states to assess (via the Watershed Approach TMDL process) the 303d list waterbodies and propose solutions. BLM is integrated with the states both through regulations and cooperative agreements. It is viewed as within BLM's capability to help define those levels of pollutants (predominantly sediment, as measured by TSS and TDS standards which are natural to the landscape**.** This can be done by developing a model which quantifies sediment loading according to soil type, land form, and climate.

Contact: Kerry Flood, Hydrologist - (435) 636-3617
125 South 600 West, Price, Utah 84501

Need: **Instream Flow Needs Assessments**

The practice of dry damming streams and rivers has caused and is causing extensive loss of riparian and aquatic habitat and irreversible damage to land-forms and channels. By allowing a perennial channel to dry up, bank storage of water can be depleted to a point where it is insufficient to support deep rooted (riparian) vegetation. When flows are resumed, usually during high flow periods of snowmelt, stream banks are severely eroded. Studies presented by Rosgen, et.al. indicate soil loss from excessive channel erosion is contributing approximately 70% of the sediment in streams. Channels in this condition are usually unstable and progress through a series of

changes. Frequently, the final result is intermittent or ephemeral surface flow in what was once a perennial stream.

Category: Research - hydrology, wildlife, rangeland health, water rights, geomorphology.

Application: We need to establish baseline flow requirements for streams and rivers to preserve them. Once minimum required flows are known, water rights should be acquired to ensure those flows are maintained. In states which do not yet recognize habitat maintenance or stream protection as beneficial uses, efforts should be made to achieve instream flows using whatever means possible until laws are amended. One possible example would be to support protection of sensitive or endangered species which depend on the riparian or aquatic habitat.

Contact: Kerry Flood, Hydrologist - (435) 636-3617
125 South 600 West, Price, Utah 84501

Need: **Completion and Publication of Geologic Maps at 1:100,000 scale for Southeastern Utah**

Category: Data acquisition - geology.

Application: Surface geologic maps are is critical to evaluations of watersheds, soils, vegetation, wildlife, etc.. Maps in Utah are being done by UGS with funding primarily by USGS. Roughly $50,000-100,000 per map. We need to inventory where we do not have such coverage, and target resources to assist UGS/USGS in getting coverage completed.

Contact: Neil Simmons, Geologist/GIS Specialist - (435) 636-3639
125 South 600 West, Price, Utah 84501

Need: **Completion and Publication of NRCS Order 3 Soil Surveys within Southeastern Utah**

Category: Data acquisition - Order 3 soil survey.

Application: Order 3 soil survey data is another critical base data layer for determining a variety of resource values and potential uses and impacts. There are approximately 750,000 acres in Emery County to be mapped. Cost has been roughly $.50/acre fro NRCS. BLM needs to target funding for NRCS to complete this inventory.

Contact: Kerry Flood, Hydrologist - (435) 636-3617
125 South 600 West, Price, Utah 84501

Need: **Impacts to Aquifers in Emery and Carbon County from Methane Gas Development**

With thousands of methane gas wells proposed for development in Emery and Carbon counties, and the tremendous amount of water associated with its recovery, we need a better understanding of the local aquifers, their interaction with regional aquifers, and the long-term impacts of producing water from and injecting it back into various formations in the area. This needs to be coordinated with a well planned monitoring program to allow comparative analysis of predictive models with actual performance of the aquifers.

Category: Research - hydrology.

Application: Information would be of extreme value when reviewing, mitigating and approving various actions associated with the development of the methane gas resource.

Contact: Kerry Flood, Hydrologist - (435) 636-3617
125 South 600 West, Price, Utah 84501

Need: **ATV Impacts Specific to the Colorado Plateau**

Although there is data and research on ATV impacts in other areas and other types of terrain, there is no specific research on the impacts of various types of ATV's on Plateau ecosystems as defined by climate, soil type and vegetative cover. What are the impacts from use of four-wheelers, dirt bikes, mountain bikes, etc. to wildlife, soils, sedimentation rates, and vegetation?

Category: Research - watershed, recreation.

Application: This type of data will allow greater predictive abilities and enhance the effectiveness of mitigation measures when analyzing soil disturbing recreational activities on public lands.

Contact: Dennis Willis, Outdoor Recreation Planner - (435) 636-3623
Kerry Flood, Hydrologist - (435) 636-3617
125 South 600 West, Price, Utah 84501

Need: **Analysis of Bacterial Runoff**

With increasing recreational uses, particularly associated with water sports, we may be facing a long-term problem with bacteria increasing in our watersheds. We need a method for determining differences between human and livestock derived bacteria in our stream sampling. We need to know how long bacteria of various forms lives outside its host. What methods are conducive to transport, etc.

Category: Research - hydrology.

Application: This type of information would allow us to identify sources and take appropriate actions when high bacterial coliform is detected in areas heavily utilized by the public.

Contact: Dennis Willis, Outdoor Recreation Planner - (435) 636-3623
Kerry Flood, Hydrologist - (435) 636-3617
125 South 600 West, Price, Utah 84501

Need: **Visitor Use Survey on the San Rafael Swell**

The San Rafael Swell is experiencing alarming recreational growth. It is also receiving national recognition with various types of long-term land management of the area (i.e., National Park, wilderness, national Conservation and Heritage Area). We have no visitor use data for the Swell.

Category: Data acquisition - recreation.

Application: We need information on total yearly visitation, daily visits, locations, length of time, origination, type of uses, and main access and entry points, to begin planning for long-term use and sustainability of the area.

Contact: Jaynee Levy, Outdoor Recreation Planner - (435) 636-3620
125 South 600 West, Price, Utah 84501

Need: **Natural Resource Base Cash Flow on the Colorado Plateau (net in vs net out)**

We have several studies of socioeconomic issues on the Plateau, i.e., jobs created, revenue flow to taxing entities, population growth, etc. What we seem to be missing is an overall view of the entire economic "flow" of goods, services and resources on the Plateau. There are no political or economic power centers on the Plateau, with Salt Lake City, Denver, Phoenix, Los Angles are all located off the Plateau. Who and where are the beneficiaries of the development of the Plateau? What is the area of economic influence on the Plateau? What are areas of common, or linked, economies on the Plateau? What are the short-term versus long-term gains and losses of extractive industry development? What can the Plateau look towards in 50 or 100 years? Will resources be depleted and the Plateau left with joblessness and other harmful social issues?

Category: Research - socioeconomic.

Application: This type of information would be of value to everyone involved with the Plateau, from natural resource managers, elected officials and the public, by having a better understanding of issues we face in the near-term..

Contact: Dennis Willis, Outdoor Recreation Planner - (435) 636-3623
125 South 600 West, Price, Utah 84501

Need: **Inventory of Native American Ethnographies (Locations of Ancestral Lands)**

With the implementation of various laws and policies dealing with Native Americans, we are required to consult with such groups prior to undertaking a majority of the uses we propose and allow on public lands. There is great difficulty, confusion, and inconsistency in how we identify ancestral homelands of interest (areas of historical interest) to current Native American groups, so that such consultation can take place.

Category: Research - ethnographic.

Application: We need data and research work to allow mapping of Native American ancestral interests on areas currently in the public domain. This will greatly speed up the consultation process and result in more consistent program implementation.

Contact: Blaine Miller, Archeologist - (435) 636-3618
125 South 600 West, Price, Utah 84501

Need: **Genetic Viability Stocking Rates of Wild Horses**

Wild horses are proliferating rapidly, resulting in increased conflict with other livestock and wild animal populations. We need to understand proper rates of wildhorse use and how to control those populations in order to sustainably manage the forage resources for them.

Category: Research - wildlife.

Application: With the sensitive job of managing wild horse populations, we need to base long-term management decisions on herd sizes on the genetic characteristics required to control and maintain individual herds as viable populations.

Contact: Mark Bailey, Assistant Field Office Manager - (435) 636-3603
125 South 600 West, Price, Utah 84501

UNCOMPAHGRE FIELD OFFICE

Need: **Historic Disturbance Regimes and Ranges of Natural Variability on the Eastern Plateau**

In order to better understand the functions of the communities that we manage, we need information on the natural plant communities prior to European settlement. This includes estimations of the frequency, size, and kinds of community disturbances that could be expected in each community type, and documentation of how large ungulates and other herbivores may have impacted the evolution of the plant communities. This work may have to be confined to specific geographic segments of the Colorado Plateau. We are interested in southwestern Colorado.

Category: Research - ecologic history.

Application: At present we are guessing at factors that affected the evolution of plant communities in southwestern Colorado, especially the role fire may have played in that evolution. The dynamics of plant communities may or may not be significantly different than prior to European settlement. We need to know where we are on the spectrum chart so we can address the need for changes in the fire program, changes in livestock grazing systems, our forestry practices, and vegetation treatments that better duplicate the processes that formed these communities.

Contact: Jim Ferguson, Wildlife Biologist - (970) 240-5307
2505 S. Townsend Ave., Montrose, Colorado 81401

Need: **Comprehensive Ecological Databases for the Colorado Plateau**

A tremendous amount of information for plant and animal species on the Plateau already exists, but much of it is inaccessible to land managers because it resides in dispersed publications or unconnected or inconsistent databases. Assembling this information into one relational, GIS databases that contain ecologic roles as well as habitat needs and other species characteristics would facilitate our understanding of ecological processes and functions on the Colorado Plateau.

Category: Data acquisition - GIS database.

Application: Extensive regional benefits would flow from the development of such a database. Compiling existing information may head off duplicative research efforts. It would give all parties access to the same information for partnership efforts or resource controversies. Combining spatial analysis and database capabilities should shed new light on regional ecosystem processes and suggest most productive areas for future research dollars. Finally, this database would present new alternatives for

evaluating existing ecologic data.

Contact: Amanda Clements, Ecologist - (970) 240-5306
2505 S. Townsend Ave., Montrose, Colorado 81401

Need: **Coordinated Rare Plant Monitoring on the Eastern Colorado Plateau**

USFWS, BLM, NPS and other agencies need assistance with designing a range-wide long-term monitoring plan and establishing studies for the rare plants that occur in the eastern Colorado Plateau. Land managers need a coordinated approach to track the impacts of management on the viability of rare plant populations of those species which occur in more than one area. In addition to identifying players and roles in a coordinated monitoring plan, this project would identify monitoring objectives on a region-wide basis, monitoring methods, acceptable levels of certainty, data analysis procedures, and data maintenance needs.

Category: Data acquisition and monitoring - vegetation.

Application: Benefits of this project would be a process for land management agencies to follow in order to meet rare plant monitoring commitments in an efficient, cost-effective manner. If this process were implemented, coordinated monitoring could pick up early warning signs of population decline or management conflicts before the declines or conflicts become extensive or range wide to the point of large scale negative biological or economic impacts.

Contact: Amanda Clements, Ecologist - (970) 240-5306
Jim Ferguson, Wildlife Biologist - (970) 240-5307
2505 S. Townsend Ave., Montrose, Colorado 81401

VERNAL FIELD OFFICE

Need: **Completion and Publication of Geologic Maps at the 1:100,000 Scale for the Colorado Plateau**

Category: Data acquisition - geology.

Application: Surface geologic maps are critical to evaluations of watersheds, soils, vegetation, wildlife, etc. Such information provides the baseline data relating to vegetation community assemblages, special status plant species habitats, paleontology potential, etc.

Contact: Jean Nitschke-Sinclear, Assistant Manager/Renewable Resources - (435) 781-4437
170 South 500 East, Vernal, Utah 84078

Need: **Current Baseline Inventory of the Natural Communities on the Colorado Plateau**

Sequence of detailed inventories by area, species/groups of targeted species, etc., presented as "status of our knowledge"-type reports, that may stand by themselves, or are complimentary to/comparable with other inventories.

Category: Inventory - vegetation, wildlife.

Application: Baseline inventories for the small, seldom-seen, often ignored components of the natural communities of the Plateau (e.g., neotropical migrating birds, reptiles, amphibians, insects, etc.) are needed to provide a more complete picture of the environment(s) of the Plateau. Such information may go a long way should a particular class of animal/plant be identified as indicator species (e.g., currently frogs are being highlighted, are there others?)

Contact: Jean Nitschke-Sinclear, Assistant Manager/Renewable Resources - (435) 781-4437
170 South 500 East, Vernal, Utah 84078

Need: **Inventory of Natural or Anthropogenic Barriers in Stream and Rivers that Support Native Fisheries on the Colorado Plateau**

Current theory in conservation biology postulates that genetic flow between subpopulations in a metapopulation is necessary for the populations to persist over time. Genetic studies have

estimated that at least a 1% influx of new individuals per generation is required to maintain allele heterozygosity and prevent genetic drift. Ongoing inventories of native cutthroat populations on the Plateau have found isolated populations of these salmonids but they are usually restricted to isolated 1st or 2nd order streams. It is theorized that these populations have persisted as "pure-strain" because physical or temperature barriers have precluded invasion by stocked, non-native salmonids. Streams identified for reintroduction of native cutthroat are generally ranked higher if they have a barrier to invasion by non-natives. While reestablishment goals have a higher probability of success if hybridization is prevented, it may only be for the short term if there is no connectivity to other populations to allow for gene exchange. An inventory is required that delineates all natural or anthropogenic barriers in streams and rivers capable of, or historically supporting native fishes.

Category: Inventory - fishery biology.

Application: Such inventory, in a GIS compatible format, would be an aid in precluding listing of native species under the Endangered Species Act. It would also be a useful tool to identify reintroduction sites, and for predictive modeling in determining where extant pure populations may still be located.

Contact: Bill Stroh, Fisheries Biologist - (435) 781-4481
170 South 500 East, Vernal, Utah 84078

Need: **Political, Social, Economical Futuring on the Colorado Plateau**

Sequence of exercises, including surveys, conducted by knowledgeable experts in both national and regional political, social and economic fields to forecast 10, 20 and 30 years out the future needs, desires and realities we could be facing.

Category: Research - socioeconomic.

Application: This type of data and research is critical to any long-term planning and modeling associated with land-management and resource use.

Contact: Jean Nitschke-Sinclear, Assistant Manager/Renewable Resources - (435) 781-4437
170 South 500 East, Vernal, Utah 84078

Need: **Analysis of Effectiveness Related to Rehabilitation/Revegetation Efforts Associated with Surface-Disturbing Actions on the Plateau**

Initial issues revolve around "success" of rehab/reveg efforts, management "success" of such efforts; are the stipulated seed mixes and land reformation actions meeting the needs of the lands and natural communities involved; are such efforts practical, economically realistic; are there practices that have been tried that exceeded our expectations, or failed to meet our expectations? If so, under what conditions did they succeed/fail; what, if any, rehabilitation practices should be applied Plateau-wide?

Category: Research - surface reclamation.

Application: A scientific evaluation of rehabilitation/revegetation efforts on the Plateau utilized by land-managing agencies and entities. A handbook incorporating the findings of the evaluation with current reclamation strategies, techniques, etc., specific to the Plateau's landscapes, would be highly beneficial to the success of reclamation activities across the board.

Contact: Jean Nitschke-Sinclear, Assistant Manager/Renewable Resources - (435) 781-4437
170 South 500 East, Vernal, Utah 84078

Need: **Geochemical Erosional Characteristics of the Mancos Shale, and Potential Impacts to Waters Quality, Wildlife and Colorado River Salinity**

The Mancos Shale, or its geologic equivalents, underlies a significant portion of the Plateau. The Mancos is easily erodible and contains a great deal of natural salts. In some of these areas BLM is dealing with proposals for relatively massive development projects. Recent concerns have surfaced regarding selenium related impacts from disturbance of the Mancos. What impacts do increased selenium concentrations have on wildlife, vegetation and culinary and irrigation water sources? Additionally, BLM works with a variety of partners in an effort to reduce salinity to the Colorado River

system. Are there accurate methods to determine what natural rates of salinity would be from erosion of the Mancos, versus enhanced salinity resulting from surface disturbing development projects?

Category: Research - geochemical, wildlife, vegetation, water quality.

Application: This type of research would allow BLM to make more informed decisions regarding development proposals that would result in significant surface disturbance to the Mancos Shale. It would help identify and develop appropriate mitigation measures for such development. It would assist in developing programs for reducing salinity concentrations in the Colorado River system. It would help identify previously unknown impacts from unnatural releases of selenium concentrations into watersheds and habitats.

Contact: Jean Nitschke-Sinclear, Assistant Manager/Renewable Resources - (435) 781-4437
170 South 500 East, Vernal, Utah 84078

Need: **Broad-Scale Mapping of Vegetative Communities on the Colorado Plateau**

Re-analysis of current satellite imagery to produce vegetative communities and across the entire Plateau region. Ground truthed to ensure accuracy of imagery.

Category: Inventory - vegetation.

Application: Vegetation communities are another fundamental building block for resource analysis and management. Current GAP vegetation mapping is inconsistent across state lines, and was never ground truthed for accuracy. Subsequently, it seldom gets utilized. We need a consistent, accurate vegetation map on 1:100,000 or 1:500,000 scale in able to conduct large-scale assessments and analysis.

Contact: Jean Nitschke-Sinclear, Assistant Manager/Renewable Resources - (435) 781-4437
170 South 500 East, Vernal, Utah 84078

Need: **Human Carrying Capacities and Environmental Thresholds**

Statistics and modeling have come a long way in the past few years. What levels of human use, both recreational and developmental, could/should be established to ensure protection of cultural, sensitive species habitats, water quality, air quality, viewsheds, audiosheds; allow for naturalness and solitude associated with open space the public has come to expect on the Plateau? Specific thresholds include: visitor numbers on rivers, popular trails/camp areas, levels of one-time/cumulative surface disturbance that may impact sensitive species and their habitats.

Category: Research - natural community and thresholds from human impact.

Application: This type of information is required to assure landscapes on the Plateau are managed in a manner to ensure the continued health and protection of the natural resource values involved.

Contact: Jean Nitschke-Sinclear, Assistant Manager/Renewable Resources - (435) 781-4437
170 South 500 East, Vernal, Utah 84078

Need: **Completion and Publication of NRCS Order 3 Soil Surveys**

Third Order soil surveys covering the Plateau. Products would be Arc-Info compatible tabulated and graphics database.

Category: Data acquisition - Order 3 soil survey.

Application: Order 3 soil survey data is another critical base data layer for determining a variety of resource values and potential uses and impacts. This level of soil inventory provides a consistent foundation for any future natural science research endeavors or natural resource management.

Contact: Jean Nitschke-Sinclear, Assistant Manager/Renewable Resources - (435) 781-4437
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